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(54) **CUSTOMIZING A SOFTWARE APPLICATION THROUGH A PATCH FILE**

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G06F 9/445 (2006.01)

(52) **U.S. Cl.** **717/169**; 717/173; 717/175; 717/178; 709/221

(58) **Field of Classification Search** 717/105–109, 717/168–178, 100, 107, 112, 163; 709/203, 709/220–223
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,325,533	A *	6/1994	McInerney et al.	717/107
5,680,619	A *	10/1997	Gudmundson et al.	717/108
5,956,481	A *	9/1999	Walsh et al.	726/23
6,073,214	A	6/2000	Fawcett	
6,161,218	A *	12/2000	Taylor	717/174
6,256,668	B1 *	7/2001	Slivka et al.	709/220
6,266,811	B1	7/2001	Nabahi	
6,487,713	B1 *	11/2002	Cohen et al.	717/105
6,601,233	B1 *	7/2003	Underwood	717/102
6,854,061	B2	2/2005	Cooper et al.	
6,931,625	B1 *	8/2005	Coad et al.	717/109
6,934,933	B2	8/2005	Wilkinson et al.	
6,957,256	B1	10/2005	Bradley et al.	
6,968,539	B1	11/2005	Huang et al.	
6,993,657	B1	1/2006	Renner et al.	
7,000,230	B1	2/2006	Murray et al.	
7,007,278	B2	2/2006	Gungabeesoon	
7,043,715	B1	5/2006	Bauer et al.	
7,055,146	B1 *	5/2006	Durr et al.	717/162
7,073,126	B1	7/2006	Khandekar	
7,073,172	B2 *	7/2006	Chamberlain	717/169
7,100,159	B2	8/2006	Claiborne	
7,127,712	B1 *	10/2006	Noble et al.	717/173
7,149,789	B2	12/2006	Slivka et al.	
7,174,370	B1	2/2007	Saini et al.	

(Continued)

OTHER PUBLICATIONS

Bainbridge, et al., "Assembling and Enriching Digital Library Collections", IEEE Computer Society, May 2003, pp. 323-334.

(Continued)

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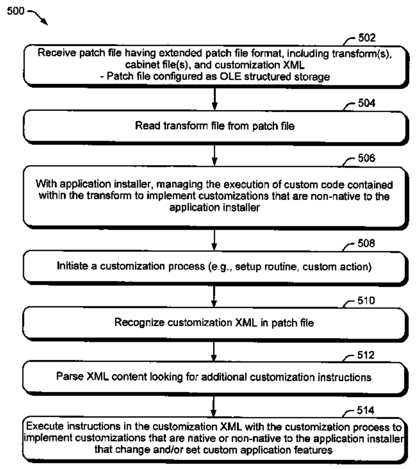
Assistant Examiner—Ryan D Coyer
(74) *Attorney, Agent, or Firm*—Lee & Hayes, PLLC

(57) **ABSTRACT**

An integrated application setup enables the implementation of application customizations through patch technology. A customization patch extends a typical patch file format such that the customization patch serves as a container for application customization data useful for customizing an application using different underlying technologies. The contents of the customization patch can include transforms, cabinet files, and XML content containing customization information.

14 Claims, 4 Drawing Sheets



500
502
Receive patch file having extended patch file format, including transform(s), cabinet file(s), and customization XML
- Patch file configured as OLE structured storage
504
Read transform file from patch file
506
With application installer, managing the execution of custom code contained within the transform to implement customizations that are non-native to the application installer
508
Initiate a customization process (e.g., setup routine, custom action)
510
Recognize customization XML in patch file
512
Parse XML content looking for additional customization instructions
514
Execute instructions in the customization XML with the customization process to implement customizations that are native or non-native to the application installer that change and/or set custom application features

U.S. PATENT DOCUMENTS

7,191,436	B1 *	3/2007	Durr et al.	717/170
7,210,097	B1	4/2007	Clarke et al.	
7,559,058	B2 *	7/2009	Blumfield et al.	717/172
2002/0124245	A1	9/2002	Maddux et al.	
2003/0009429	A1	1/2003	Jameson	
2003/0033597	A1 *	2/2003	Allsop et al.	717/169
2003/0145317	A1 *	7/2003	Chamberlain	717/177
2003/0167463	A1 *	9/2003	Munsil et al.	717/170
2003/0225866	A1 *	12/2003	Hudson	709/221
2004/0199615	A1	10/2004	Philyaw	
2004/0225671	A1	11/2004	Carroll et al.	
2005/0132179	A1	6/2005	Glaum et al.	
2005/0193389	A1	9/2005	Murphy et al.	
2005/0257208	A1 *	11/2005	Blumfield et al.	717/168
2005/0273461	A1	12/2005	Jameson	
2006/0031407	A1	2/2006	Dispensa et al.	
2007/0055707	A1	3/2007	Dandekar et al.	
2007/0174834	A1	7/2007	Purkeypile et al.	
2008/0021778	A1	1/2008	Perkowski et al.	

OTHER PUBLICATIONS

Shegalov, et al., "XML-enabled workflow management for e-services across heterogenous platforms", Springer-Verlag New-York, inc, Apr. 27, 2001, pp. 91-103.

Weber, et al.., "Live Documents with Contextual, Data-Driven Information Components", ACM, Oct. 2002, pp. 236-247.

* cited by examiner

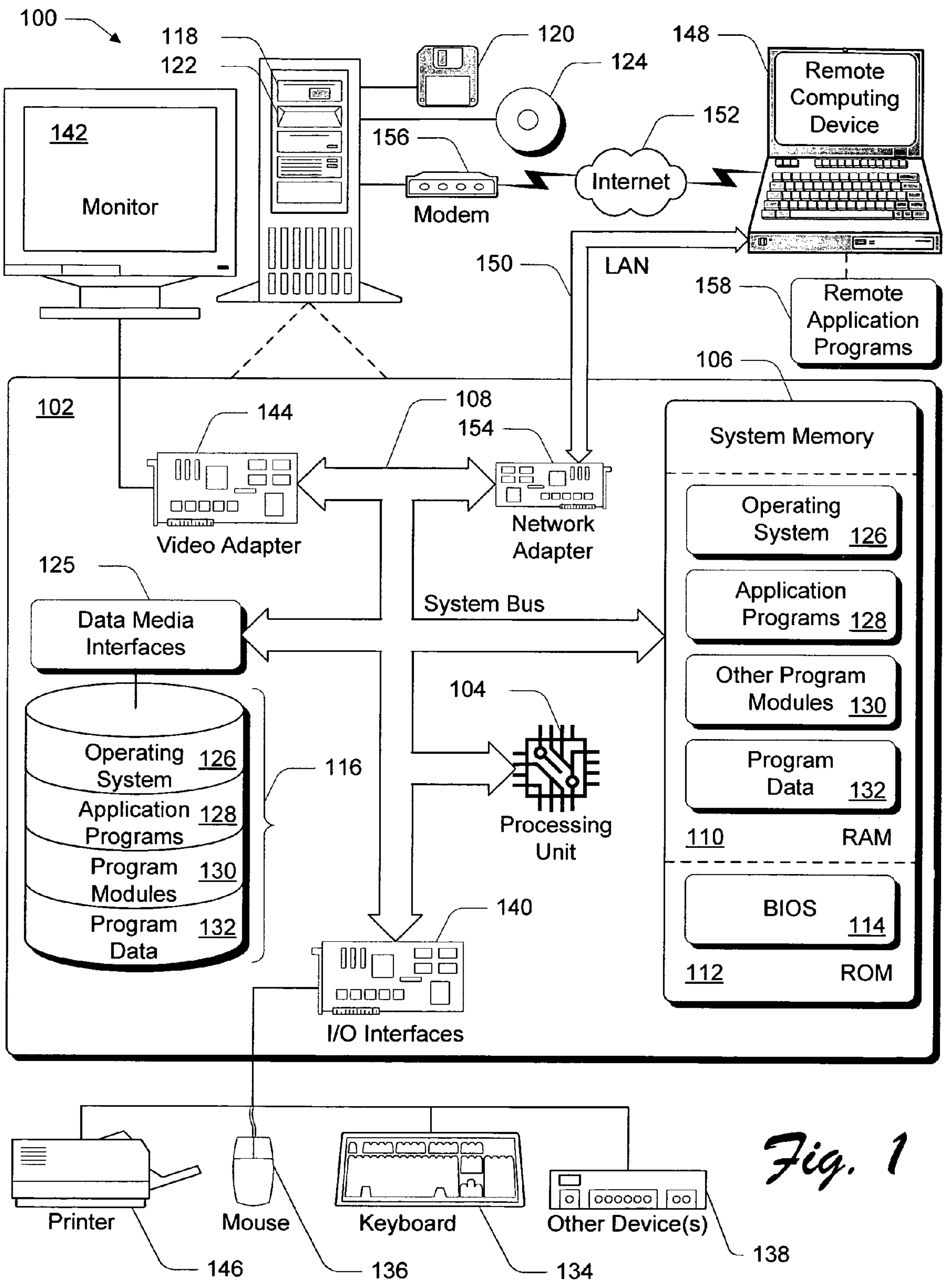

100
118
122
120
124
148
Remote Computing Device
142
Monitor
156
152
Internet
Modem
150
LAN
158
Remote Application Programs
106
102
144
108
154
System Memory
Video Adapter
Network Adapter
Operating System 126
Application Programs 128
125
System Bus
Data Media Interfaces
Other Program Modules 130
104
Operating System 126
Application Programs 128
Program Modules 130
Program Data 132
116
Processing Unit
Program Data 132
110 RAM
BIOS 114
112 ROM
140
I/O Interfaces
Printer
Mouse
Keyboard
Other Device(s)
146
136
134
138

Fig. 1

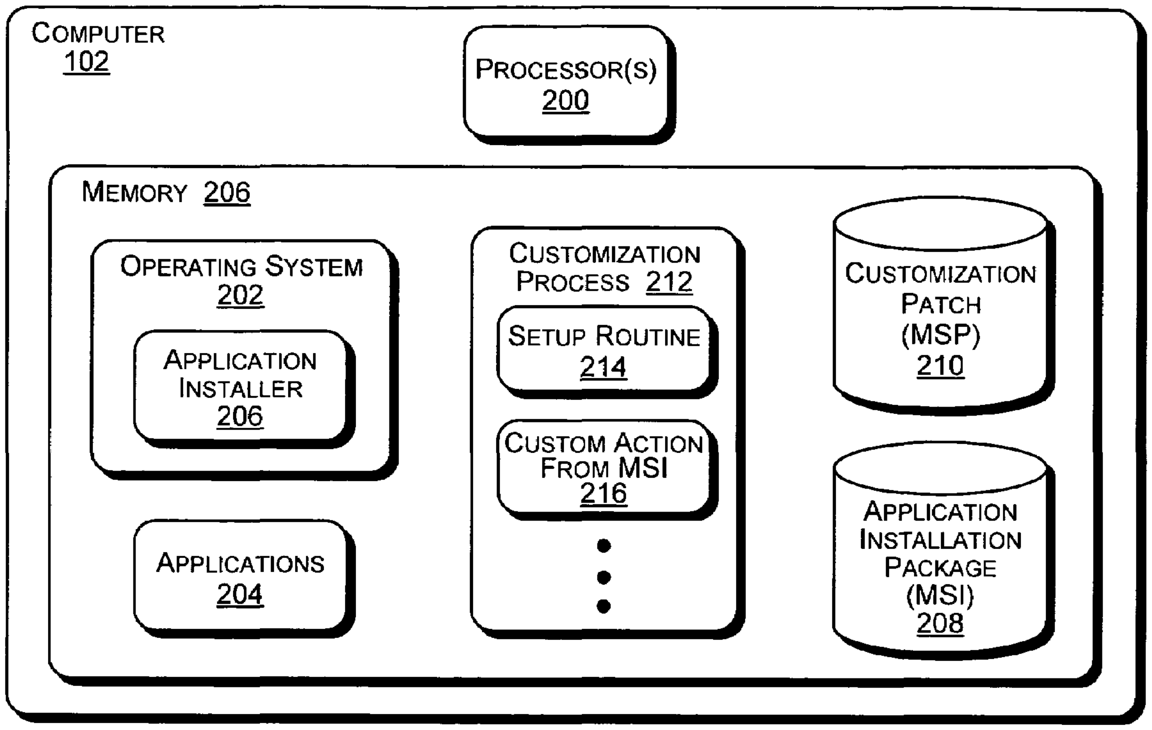

Computer 102
Processor(s) 200
Memory 206
Operating System 202
Application Installer 206
Applications 204
Customization Process 212
Setup Routine 214
Custom Action From MSI 216
Customization Patch (MSP) 210
Application Installation Package (MSI) 208

Fig. 2

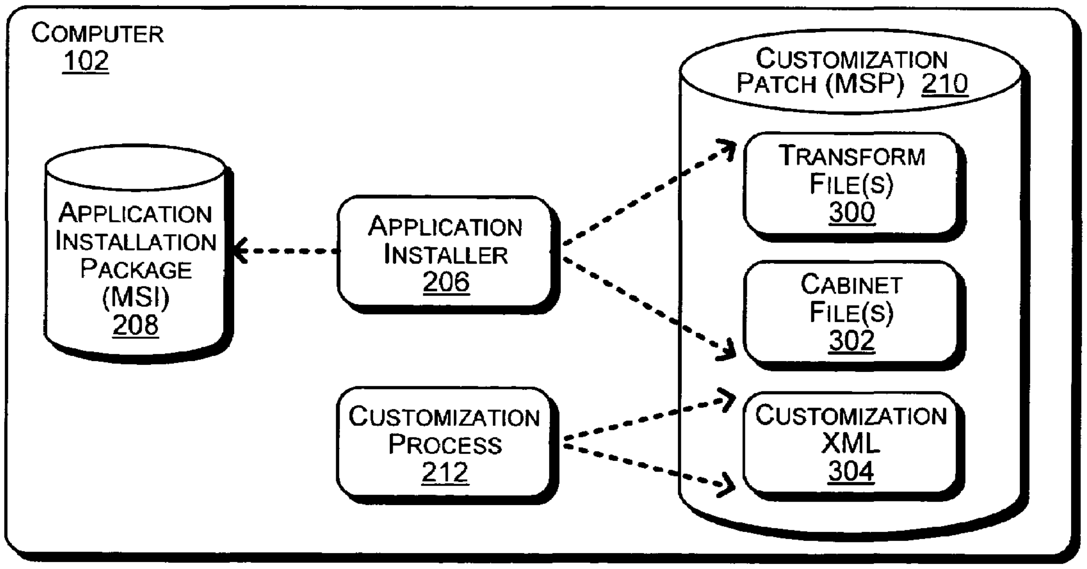

Computer 102
Application Installation Package (MSI) 208
Application Installer 206
Customization Process 212
Customization Patch (MSP) 210
Transform File(s) 300
Cabinet File(s) 302
Customization XML 304

Fig. 3

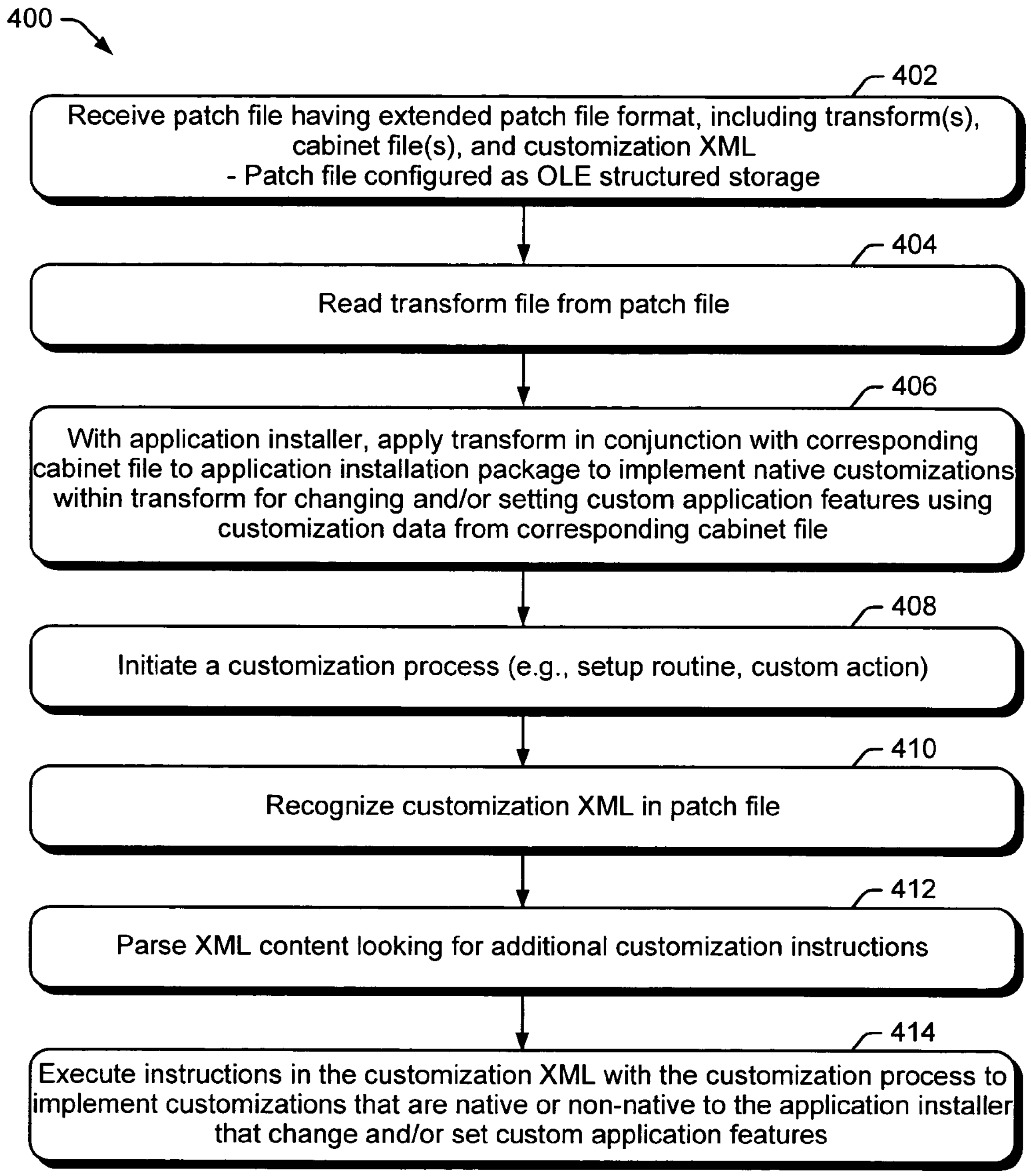
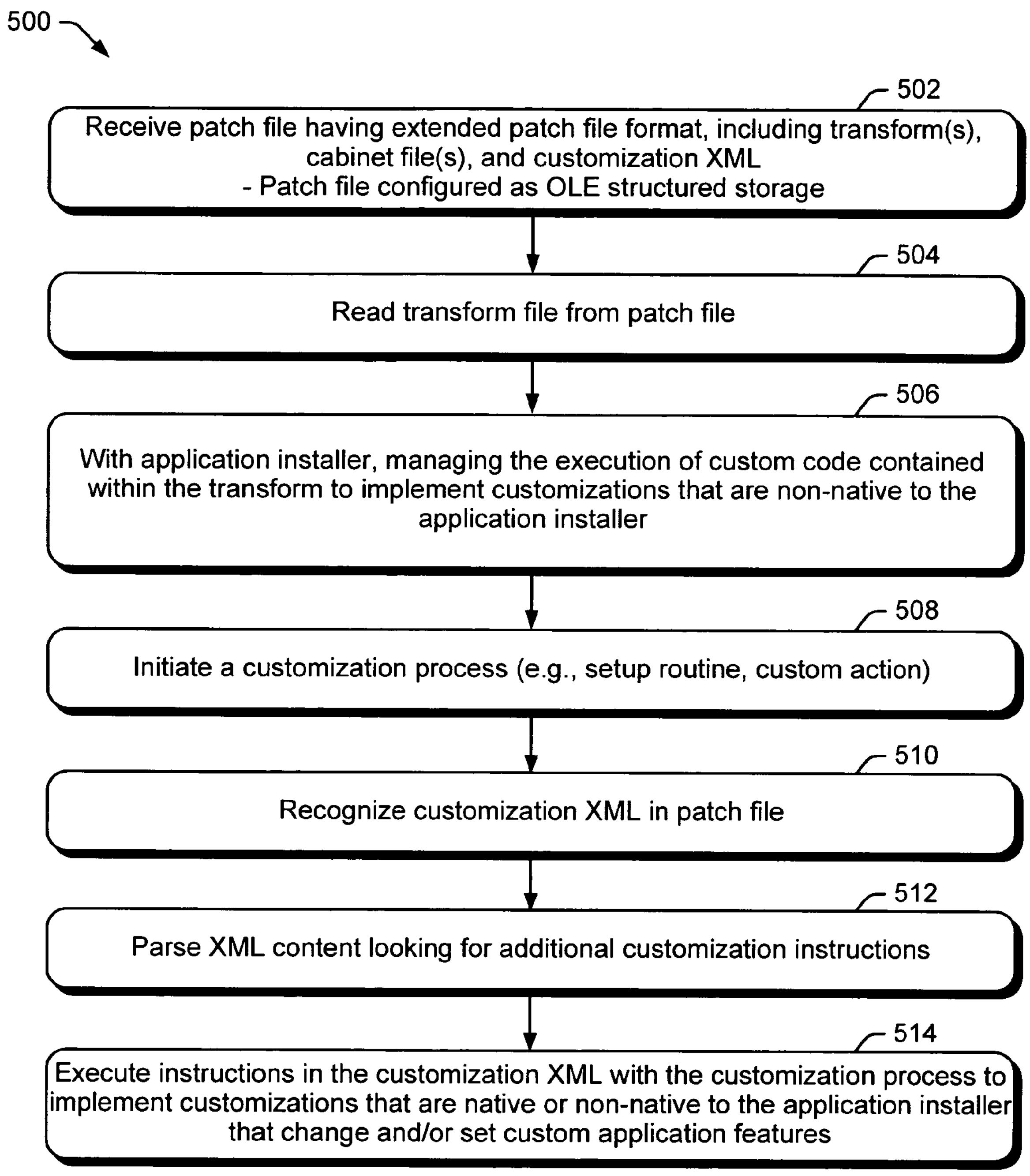

400
402
Receive patch file having extended patch file format, including transform(s), cabinet file(s), and customization XML
- Patch file configured as OLE structured storage
404
Read transform file from patch file
406
With application installer, apply transform in conjunction with corresponding cabinet file to application installation package to implement native customizations within transform for changing and/or setting custom application features using customization data from corresponding cabinet file
408
Initiate a customization process (e.g., setup routine, custom action)
410
Recognize customization XML in patch file
412
Parse XML content looking for additional customization instructions
414
Execute instructions in the customization XML with the customization process to implement customizations that are native or non-native to the application installer that change and/or set custom application features

Fig. 4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Receive patch file having extended patch file format, including transform(s), cabinet file(s), and customization XML
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Fig. 5

CUSTOMIZING A SOFTWARE APPLICATION THROUGH A PATCH FILE

TECHNICAL FIELD

The present disclosure generally relates to customizing applications, and more particularly, to customizing applications through patch files.

BACKGROUND

Prior to installation on a computer, most applications are customized to better suit the needs of the user. Customizing an application is to set or change features of the application based, for example, on a user's individual desires or based on customization needs determined by an administrator for a given user environment having many users. Customizing applications provides a consistent experience for users and reduces problems users have interacting with the software. Accordingly, software applications are generally deployed in a very specific manner. As an example, applications that an individual can purchase, download, and install from a Web site are typically customized by the vendor to include particular settings, preferences, defaults, etc., that are most likely to be useful to a typical end-user. In a different scenario, administrators responsible for deploying applications to client computers across large organizations typically pre-configure customizations in a manner to best suit various targeted groups of users. For example, for a particular application, an administrator may implement customization settings for users in an accounting department that are different than the customization settings implemented for users in an engineering department.

Current methods for implementing application customizations have various disadvantages. For example, one exemplary method for customizing an application requires a set of tools to implement the customizations. The customization tools are not included with the application itself, but instead must be accessed separately by a user or administrator before any customizations can be made. In addition, the customization tools work separately from one another, and their applicability depends upon whether or not the application has already been installed.

In a pre-installation scenario (i.e., at application deployment time), for example, a customization installation tool is used to read information from an application installation package and present customization options to a user or administrator. The customization installation tool generates a transform based on input from a user that indicates the user's customization intent. The transform can be applied exclusively, and only one time, to the application installation package. Applying the transform to the installation package results in the software application being installed on a computer with the customizations specified during the pre-installation customization session. However, once the application is installed, the customization installation tool cannot be used again to update, alter, or fix customizations should the need arise due to an inadvertent customization mistake or customization requirements that may change over time. Furthermore, in a scenario where an administrator needs to create different deployment versions or custom installations for an application across a variety of user groups (e.g., secretaries, engineers, accountants, etc.), the customization installation tool needs to be run separately and in its entirety for each different deployment version.

In a post-installation scenario (i.e., at application maintenance time), once an application has been installed, any

changes that need to be made to customizations require the use of a second, post-installation customization tool. For example, if an administrator forgets to turn off a particular setting in an application during a pre-installation customization session, he would have to start a new customization process over again, using a different post-installation customization tool. In a post-installation customization session, the post-installation customization tool generates a maintenance file that is loaded onto the computer to make changes to the application customizations according to the user's intent as entered during the post-installation customization session. Unlike the transform noted above in the pre-installation customization, the maintenance file can be used multiple times per product to make changes to the application customizations. However, each time a need arises to make additional changes to the customizations, an administrator must begin from scratch, using the post-installation customization tool to make appropriate customization alterations. Furthermore, in a scenario where an administrator needs to make varying customization changes to different deployment versions across a variety of user groups (e.g., secretaries, engineers, accountants, etc.), the post-installation customization tool needs to be run separately and in its entirety for each different deployment version.

Thus, a significant disadvantage with current customization methods is that numerous custom installations or changes to numerous custom installations require that the pre- and post-installation customization tools be run separately and in their entirety for each different custom installation or change made to a custom installation. Another disadvantage is that a user's customization intent is tied exclusively to a particular manner of implementation. Any adjustment to that customization intent requires that the particular method of implementation be exercised again in its entirety. Yet another disadvantage is the disjointed manner in which customizations are made. That is, the use of pre- and post-installation customization tools requires that a user or administrator become familiar with two different tools in order to implement customizations on an application. Other disadvantages with current customization methods are that they are not integrated with the standard setup procedures of the applications and the customization tool(s) themselves must be accessed separately from the application media.

Accordingly, a need exists for an integrated application setup that enables application customizations to be managed in both pre- and post-installation scenarios and in scenarios where different application deployment versions require varying application customizations.

SUMMARY

A system and methods provide an integrated application setup that enables the implementation of application customizations through a patch. A customization patch extends a typical patch file format and serves as a container for additional application customization data. The contents of the customization patch can include transforms, cabinet files, and XML content containing customization information.

An application installer on a client computer, for example, recognizes and executes the patch transforms in conjunction with the patch cabinet files against a targeted application installation package in order to implement customizations contained within the transforms. A separate customization process executing on the client computer (e.g., code executing from a setup routine, a custom action from the application installation package, etc.) is configured to recognize the addi-

tional customization XML content within the patch and to implement the customization directives contained in the XML content.

Customizations contained in the customization patch can be native to the application installation and thus be managed by the application installer. In addition, custom code contained within a patch transform or the customization XML can provide customizations that are not native to the application installation. Accordingly, the application installer manages the execution of the custom code which itself implements the non-native customization.

BRIEF DESCRIPTION OF THE DRAWINGS

The same reference numerals are used throughout the drawings to reference like components and features.

FIG. **1** illustrates an exemplary computing environment suitable for implementing application customizations through patches.

FIG. **2** illustrates an exemplary embodiment of a computer configured for implementing application customizations through patches.

FIG. **3** illustrates additional details regarding components of a customization patch and functional aspects related to the customization patch.

FIG. **4** is a flow diagram illustrating exemplary methods for implementing application customizations through patches.

FIG. **5** is a flow diagram illustrating additional exemplary methods for implementing application customizations through patches.

DETAILED DESCRIPTION

Introduction

The following discussion is directed to a system and methods that enable application customizations to be made through patches. A patch file format, typically used for updating product/application binaries, is extended to create a customization patch that includes customization information represented in a collection of underlying technologies which enable the customizations. Such technologies include, for example, custom actions built in to an application installation package and customization XML contained in the customization patch.

Advantages of the described system and methods include, for example, the ability to use established patch deployment technologies which avoids the need for an alternative customization deployment process. Another advantage includes an integrated application setup that enables application customizations to be managed at both deployment time and maintenance time.

Exemplary Computing Environment

FIG. **1** illustrates an exemplary computing environment suitable for implementing application customizations through patches. Although one specific configuration is shown in FIG. **1**, such computing devices may be implemented in other computing configurations.

The computing environment **100** includes a general-purpose computing system in the form of a computer **102**. The components of computer **102** may include, but are not limited to, one or more processors or processing units **104**, a system memory **106**, and a system bus **108** that couples various system components including the processor **104** to the system memory **106**.

The system bus **108** represents one or more of any of several types of bus structures, including a memory bus or

memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. An example of a system bus **108** would be a Peripheral Component Interconnects (PCI) bus, also known as a Mezzanine bus.

Computer **102** includes a variety of computer-readable media. Such media can be any available media that is accessible by computer **102** and includes both volatile and non-volatile media, removable and non-removable media. The system memory **106** includes computer readable media in the form of volatile memory, such as random access memory (RAM) **110**, and/or non-volatile memory, such as read only memory (ROM) **112**. A basic input/output system (BIOS) **114**, containing the basic routines that help to transfer information between elements within computer **102**, such as during start-up, is stored in ROM **112**. RAM **110** contains data and/or program modules that are immediately accessible to and/or presently operated on by the processing unit **104**.

Computer **102** may also include other removable/non-removable, volatile/non-volatile computer storage media. By way of example, FIG. **1** illustrates a hard disk drive **116** for reading from and writing to a non-removable, non-volatile magnetic media (not shown), a magnetic disk drive **118** for reading from and writing to a removable, non-volatile magnetic disk **120** (e.g., a “floppy disk”), and an optical disk drive **122** for reading from and/or writing to a removable, non-volatile optical disk **124** such as a CD-ROM, DVD-ROM, or other optical media. The hard disk drive **116**, magnetic disk drive **118**, and optical disk drive **122** are each connected to the system bus **108** by one or more data media interfaces **125**. Alternatively, the hard disk drive **116**, magnetic disk drive **118**, and optical disk drive **122** may be connected to the system bus **108** by a SCSI interface (not shown).

The disk drives and their associated computer-readable media provide non-volatile storage of computer readable instructions, data structures, program modules, and other data for computer **102**. Although the example illustrates a hard disk **116**, a removable magnetic disk **120**, and a removable optical disk **124**, it is to be appreciated that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes or other magnetic storage devices, flash memory cards, CD-ROM, digital versatile disks (DVD) or other optical storage, random access memories (RAM), read only memories (ROM), electrically erasable programmable read-only memory (EEPROM), and the like, can also be utilized to implement the exemplary computing system and environment.

Any number of program modules can be stored on the hard disk **116**, magnetic disk **120**, optical disk **124**, ROM **112**, and/or RAM **110**, including by way of example, an operating system **126**, one or more application programs **128**, other program modules **130**, and program data **132**. Each of such operating system **126**, one or more application programs **128**, other program modules **130**, and program data **132** (or some combination thereof) may include an embodiment of a caching scheme for user network access information.

Computer **102** can include a variety of computer/processor readable media identified as communication media. Communication media embodies computer readable instructions, data structures, program modules, or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. The term “modulated data signal” means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared, and other wireless media. Combinations of any of the above are also included within the scope of computer readable media.

A user can enter commands and information into computer system **102** via input devices such as a keyboard **134** and a pointing device **136** (e.g., a "mouse"). Other input devices **138** (not shown specifically) may include a microphone, joystick, game pad, satellite dish, serial port, scanner, and/or the like. These and other input devices are connected to the processing unit **104** via input/output interfaces **140** that are coupled to the system bus **108**, but may be connected by other interface and bus structures, such as a parallel port, game port, or a universal serial bus (USB).

A monitor **142** or other type of display device may also be connected to the system bus **108** via an interface, such as a video adapter **144**. In addition to the monitor **142**, other output peripheral devices may include components such as speakers (not shown) and a printer **146** which can be connected to computer **102** via the input/output interfaces **140**.

Computer **102** may operate in a networked environment using logical connections to one or more remote computers, such as a remote computing device **148**. By way of example, the remote computing device **148** can be a personal computer, portable computer, a server, a router, a network computer, a peer device or other common network node, and the like. The remote computing device **148** is illustrated as a portable computer that may include many or all of the elements and features described herein relative to computer system **102**.

Logical connections between computer **102** and the remote computer **148** are depicted as a local area network (LAN) **150** and a general wide area network (WAN) **152**. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet. When implemented in a LAN networking environment, the computer **102** is connected to a local network **150** via a network interface or adapter **154**. When implemented in a WAN networking environment, the computer **102** includes a modem **156** or other means for establishing communications over the wide network **152**. The modem **156**, which can be internal or external to computer **102**, can be connected to the system bus **108** via the input/output interfaces **140** or other appropriate mechanisms. It is to be appreciated that the illustrated network connections are exemplary and that other means of establishing communication link(s) between the computers **102** and **148** can be employed.

In a networked environment, such as that illustrated with computing environment **100**, program modules depicted relative to the computer **102**, or portions thereof, may be stored in a remote memory storage device. By way of example, remote application programs **158** reside on a memory device of remote computer **148**. For purposes of illustration, application programs and other executable program components, such as the operating system, are illustrated herein as discrete blocks, although it is recognized that such programs and components reside at various times in different storage components of the computer system **102**, and are executed by the data processor(s) of the computer.

EXEMPLARY EMBODIMENTS

FIG. **2** illustrates an exemplary embodiment of a computer **102** configured for implementing application customizations through patches. Computer **102** includes one or more processors **200** configured to execute an operating system **202** and various application programs **204** stored in a memory **206**.

The operating system **202** of computer **102** is shown as including an application installer component **206**. Application installer **206** is generally configured as an operating system service to install applications **204** on computer **102**. Application installer **206** implements a custom installation of an application by applying transforms to a target application installation package **208** associated with the software application being installed. An application installation package **208** is a database that contains a large group of instructions that tell the application installer **206** how the application is to be installed. An example of an application installation package **208** is a Microsoft Windows Installer Package (MSI package). An MSI file contains a database that stores all the instructions and data required to manage the state of a program, such as adding, changing, or removing it from a computer **102**. For example, an MSI file of an application can contain instructions for installing the application on a computer when a prior version of the application is already installed or where that application has never been present.

In addition to installing applications **204**, application installer **206** is configured to implement patch technology. Traditionally, patch functionality has been used only to update application binaries for purposes such as security fixes or other program bugs. Thus, patches are typically developed and distributed to replace or be inserted into compiled code (i.e., a binary file or object module). However, in the current embodiment described here, patch functionality that is native to the application installer **206** is used to implement application customizations. Thus, custom features, settings, operating characteristics, and the like, can be implemented through the use of patch technology which has traditionally been used for repairing or updating application binaries. As discussed in more detail herein below with regard to FIG. **3**, the native patch functionality of the application installer **206** is leveraged to enable application customizations through the use of a customization patch **210** having an extended patch file format that includes application customization information.

One example of an application installer **206** is Microsoft® Windows® Installer, available from Microsoft Corporation of Redmond, Wash. The Microsoft Windows Installer enables managing the state of software applications. This includes managing the installation, modification, upgrade, or removal of software applications. Thus, the installer performs functions such as modifying applications, upgrading applications, and removing applications that have been installed on a computer **102**. Throughout this disclosure, application installer **206** is discussed in terms of the Microsoft Windows Installer. Accordingly, additional information regarding application installer **206** is available from Microsoft Corporation, Redmond, Wash., with reference to the Microsoft Windows Installer.

Referring again to FIG. **2**, computer **102** also includes a customization process **212**. Like application installer **206**, customization process **212** also executes against customization patch **210**. However, customization process **212** executes separately from the application installer **206**, and as discussed more fully below regarding FIG. **3**, it recognizes and operates against customization information (i.e., customization XML) within the customization patch **210** that application installer **206**, by design, does not recognize. Thus, customization process **212** is a set of code generally configured to recognize and implement additional customization information that is contained within a customization patch **210**.

Customization process **212** can be implemented in various ways. For example, customization process can be implemented as part of an application setup routine **214** such as "setup.exe". Thus, a user may initiate a setup routine **214** in a particular mode (e.g., a customization mode) that implements application customizations by recognizing and executing customization information within the customization patch **210** that the application installer **206** is not designed to recognize. Customization process **212** might also be implemented as one or more custom actions **216** installed on computer **102** from an application installation package **208**. That is, a custom action **216** configured to recognize and execute customization XML from the patch file **210**, may be installed on computer **102** during installation of the application installation package **208** by the application installer **206**.

FIG. **3** illustrates additional details regarding components of a customization patch **210** and functional aspects related to the customization patch **210**. As shown in FIG. **3**, a customization patch **210** includes transform files **300**, cabinet files **302**, and customization XML **304**.

Traditionally, a patch provides a way to update and maintain an application **204**. One example of a patch is a Windows Installer Patch file (MSP). Application installer **206** includes native capability for implementing MSP patch functionality. An MSP patch file represents an updated component of an application or portion of the application **204**. Patch files are usually obtained from a software manufacturer or developer of the original application program. Traditionally, patches enable updates to existing applications without having to uninstall the product, which preserves the customizations of the application installation. Thus, in the past, patches have not included customization information for setting or changing features or characteristics of an application. Patches may change only a few bytes of a single application file, or they may change all of the files and registry keys in a product.

An MSP patch file does not include a database like a regular application installation package **208**. Rather, it contains a database transform file or files configured to add information to the database of its target application installation package **208**. It also contains cabinet files that application installer **206** uses to apply the patch files that are stored in the cabinet file stream of the patch file package. The files in an MSP patch are stored in an OLE structured storage format. OLE is Microsoft's framework for a compound document technology.

In the present embodiment, the customization patch **210** represents an extension of the MSP patch file format. Thus, as noted above, in addition to containing transform files **300** and cabinet files **302**, customization patch **210** also contains customization XML **304**. The customization patch **210** is preferably stored in a compound document format such as OLE structured storage. The customization XML **304** represents customizations contained within transforms **300**. More generally, the customization XML **304** represents customization intent of a user generated, for example, through a customization user interface (not shown) that is part of an integrated application setup enabling application customizations to be managed at both application deployment time and application maintenance time. For purposes of the present disclosure, the manner in which the customization XML **304** is generated or incorporated into the customization patch **210** is immaterial and therefore will not be discussed in any further detail. In addition to representing customizations contained within transforms **300**, the customization XML **304** can contain additional customization information that can be readily consumed and implemented by a customization process **212**.

The customization XML **304** is generic in that it can be used to implement customization intent using various arbitrary customization technologies. For example, in the current implementation, the customization XML **304** has been consumed by Windows Installer Transform technology which generated transforms **300** that will be used by application installer **206** as discussed below to effect application customizations. The customization XML **304** can also be consumed by a customization application to display current customizations to a user through a UI and permit further customizations to be made.

FIG. **3** is intended to show how a customization patch **210** is used or consumed by components of computer **102** in the process of customizing an application. When a customization patch **210** is received, the application installer **206** (e.g., Microsoft Windows Installer), using its native patch technology functionality, accesses the patch **210** and recognizes any transforms **300** and cabinet files **302**, as indicated in FIG. **3**. The application installer **206** does not recognize, and therefore ignores, the customization XML **304**. The application installer **206** implements the transforms **300** as it normally would in the case where it was patching binaries for the application. However, in the present embodiment, the transforms contain a set of customization changes for the application that the application installer **206** applies to the application installation package **208**. Thus, instead of repairing or updating part of the application binary file with code, the patch contains customization instructions and data that are used to set or make changes to features and/or operational characteristics of the application. The types of customizations depend to some extent on the application being customized, but may include, for example, default page settings in a word processing application (e.g., margins, spacing, fonts, font sizes, etc.). Such customizations may be based, for example, on an individual user's customization desires, or on the customization needs of a given user environment serving many users as determined by an administrator. When the application installer **206** implements the transforms **300**, the database of the application installation package **208** is updated using relevant data stored in the cabinet files **302**, and the appropriate customization settings and features within the application are updated.

Customizations that are not part of the native functionality of the application installer **206** can also be achieved by the application installer **206** using custom code contained in a transform **300**. Custom code in a transform **300** can direct the application installer **206** to make a particular application customization that is not native to the installer **206**. An example of a non-native customization might be changing the organization name in an application. Suppose for instance that "Company X" has 100 client computers each having a document editing application installation. At some time, such as upon initial deployment, the document editing application is customized to indicate that Company X is the organization that owns the application. At some later time, however, "Company Y" buys Company X and wants to update the customizations for the document editing application on all the client computers. As noted above, changing the organization name is not a customization that is within the native functionality of the application installer **206**. However, in the current embodiment, the customization update can be achieved by generating custom code, that when executed, will perform this non-native customization. The custom code is passed to the application installer **206** via a transform **300** contained in a customization patch **210**. The application installer **206** accesses the transform **300** and executes the custom code, which instructs the installer **206** how to make the organization name update, using data from a cabinet file **302**. The data in the cabinet file **302** may include, for example, the new name of the company, "Company Y".

FIG. **3** further illustrates how additional customization information within the customization XML **304** can be consumed by a customization process **212** (e.g., a setup routine **214**, custom actions from an application installation package, etc.) in order to effect further application customizations and/or alter the behavior of a process on computer **102**. As noted above, customization XML **304** generally provides a road map to customizations contained in the transforms **300** and implemented through the application installer **206**. However, customization XML **304** can also include additional customization information that is accessible to a customization process **212**. For example, a setup routine **214** initiated by a user in a customization mode may be configured to parse the customization XML and recognize and implement various instructions contained in the XML. The XML may include instructions such as instructions to alter a behavior of a particular process or instructions to make customization changes to an application. For instance, additional information in customization XML **304** could instruct setup routine **214** to change its login level from a basic level to a verbose level. When the setup routine **214** parses the XML and reads it in, it knows to toggle its login level from basic to verbose.

EXEMPLARY METHODS

Example methods for implementing application customizations through patches will now be described with primary reference to the flow diagrams of FIGS. **4** and **5**. The methods apply generally to the exemplary embodiments discussed above with respect to FIGS. **1**-**3**. While one or more methods are disclosed by means of flow diagrams and text associated with the blocks of the flow diagrams, it is to be understood that the elements of the described methods do not necessarily have to be performed in the order in which they are presented, and that alternative orders may result in similar advantages. Furthermore, the methods are not exclusive and can be performed alone or in combination with one another. The elements of the described methods may be performed by any appropriate means including, for example, by hardware logic blocks on an ASIC or by the execution of processor-readable instructions defined on a processor-readable medium.

A "processor-readable medium," as used herein, can be any means that can contain, store, communicate, propagate, or transport instructions for use or execution by a processor. A processor-readable medium can be, without limitation, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples of a processor-readable medium include, among others, an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable-read-only memory (EPROM or Flash memory), an optical fiber (optical), a rewritable compact disc (CD-RW) (optical), and a portable compact disc read-only memory (CDROM) (optical).

Method **400** is an example method for implementing application customizations through patches. At block **402** of method **400**, a patch file is received on a computer **102**. The patch file is a customization patch file that contains customization information for customizing an application on computer **102**. The customization information in the patch file is contained in one or more transform files, cabinet files, and XML content. The transform files contain the customizations to be applied to an application installation package, while the cabinet files contain data related to the customizations that is used to update the customizations. The XML content provides a road map of the customizations contained in the transform files. The XML content is a generic expression of a user's customization intent, and can include additional customization information not found in the transform files. The contents of the patch file (i.e., transform files, cabinet files, XML content) are generally structured in a compound document format such as Microsoft's OLE structured storage format.

At block **404**, after receiving the patch file, an application installer reads a transform file from the patch file in a manner consistent with its native patch functionality. At block **406**, the application installer applies the transform and a corresponding cabinet file to an application installation package. Application of the customizations contained in the transform and the data from the cabinet file implement customizations in the application that are native to the functionality of the application installer **206**. The customizations set or make changes to custom features in the application according to a user's or administrator's desires.

The method continues at block **408** where a customization process is initiated. The customization process is independent of the application installer **206**. The customization process enables application customizations to be implemented based on additional customization information contained within the XML content. Because the application installer **206** is not designed to recognize the XML content, it ignores the XML content. However, the separate customization process on computer **102** is configured to recognize the presence of the XML content in the patch file as shown at block **410**. At block **412**, the customization process parses the XML content looking for additional customization instructions. The customization instructions are executed at block **414** to implement customizations that may be native or non-native to the application installer **206**. As indicated at block **408**, the customization process can be implemented in a number of ways. For example, the customization process can be configured as part of the application setup routine or a particular execution mode of the application setup routine. The customization process might also be configured as one or more stand-alone custom actions installed on computer **102** from the application installation package.

Method **500** is another example method for implementing application customizations through patches. At block **502** of method **500**, a patch file is received on a computer **102**. As in the method **400** above, the patch file is a customization patch file that contains customization information for customizing an application on computer **102**. The customization information in the patch file is contained in one or more transform files, cabinet files, and XML content. However, in this method, a custom code technology is used to implement the customizations. The transform file(s) contains custom code configured to implement customizations that may be non-native to the application installer **206**. That is, customizations that the application installer **206** may not be designed to implement can be implemented through the use of custom code contained in a transform file that is configured to implement such a non-native customization.

At block **504**, the application installer reads the transform file in the patch file. The application installer then manages the execution of the custom code in the transform, as shown at block **506**. Execution of the custom code implements the customizations that may be non-native to the application installer **206**.

The method **500** then continues in a manner similar to method **400**, where a customization process may be initiated (block **508**) to recognize customization XML in the patch file (block **510**) and to parse the XML content for customization instructions (block **512**). At block **514**, instructions from XML content within the patch file are executed to implement customizations that may be native or non-native to the application installer **206**.

Application customizations can be implemented using a patch file at virtually any time. For example, application customizations can be implemented during the deployment or installation of an application onto one or more computers. Application customizations can also be implemented at anytime, and in any number, after installation of the application onto the computer.

CONCLUSION

Although the invention has been described in language specific to structural features and/or methodological acts, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as exemplary forms of implementing the claimed invention.

The invention claimed is:

1. A method for customizing an application implemented at least in part by a computing device comprising:

receiving an Object Linking and Embedding (OLE) structured storage patch file containing a transform file, wherein the transform filed comprises custom code, a cabinet file, and XML content; and

customizing an executable application with an application installer according to the information contained in the received patch file, the customizing comprising making changes to one or more features of the executable application, wherein the customizing differs from native functionality of the application installer.

2. A method as recited in claim **1**, wherein the customizing comprises applying a transform file contained within the patch file to an application installation package.

3. A method as recited in claim **1**, wherein customizing the application comprises executing XML contained within the patch file to implement a customization process previously installed from an application installation package and configured to recognize and execute the XML.

4. A method as recited in claim **3**, wherein implementing a customization process is selected from the group comprising:

executing a setup routine configured to recognize the XML, parse the XML for customization instructions, and execute the customization instructions; and

executing a custom action configured to recognize the XML, parse the XML for customization instructions, and execute the customization instructions.

5. A method as recited in claim **1**, wherein customizing the application is customizing the application in a manner selected from the group comprising:

customizing the application during installation of the application; and

customizing the application after installation of the application.

6. One or more processor-readable storage media having processor-executable instructions configured for:

receiving an Object Linking and Embedding (OLE) structured customization patch file having extended patch file format, including a transform file, a cabinet file, and XML content, wherein the transform file contains custom code that directs an application installer to make a particular customization to an application the customization comprising enabling a feature of the application, wherein the customization differs from native functionality of the application installer;

parsing the customization patch file to locate application customization information, the parsing comprising recognizing the transform file, the cabinet file, and the XML content within the customization patch file; and

implementing the customization to the application, wherein changes to one or more features of the application are made based on the application customization information in the customization patch file.

7. One or more processor-readable storage media as recited in claim **6**, wherein implementing an application customization is implementing an application customization in a manner selected from the group comprising:

implementing the application customization by executing custom code within the transform file; and

implementing the application customization based on information in the XML content.

8. One or more processor-readable storage media as recited in claim **6**, wherein implementing an application customization comprises implementing an application customization during an installation of the application.

9. One or more processor-readable storage media as recited in claim **6**, wherein implementing an application customization comprises implementing an application customization after an installation of the application.

10. A computer comprising the one or more processor-readable storage media as recited in claim **6**.

11. A computer comprising:

a processor; and

one or memory devices coupled to the processor, wherein the one or more memory devices are encoded with:

an Object Linking and Embedding (OLE) structured customization patch file having information for customizing an application, the information comprising:

a transform file, wherein the transform filed comprises custom code;

a cabinet file; and

customization XML; and

an application installer configured to customize the application based on the information in the customization patch, wherein the application installer is configured to execute the custom code to implement a customization, and wherein the customization differs from native functionality of the application installer and wherein, when the application installer installs the application for which the customization patch has information for customizing, the information in the customization patch is used to customize the application with customization comprising:

adding a new application feature;

changing a setting of the application; and

changing an operating characteristic of the application.

12. A computer as recited in claim **11**, further comprising an application installation package, wherein the application installer is configured to apply customizations contained in the transform file to the application installation package.

13. A computer as recited in claim **12**, further comprising a customization process configured to parse the customization XML and implement application customizations according to instructions within the customization XML.

14. A computer as recited in claim **13**, wherein the customization process is selected from a group comprising:

an application setup routine; and

a custom action installed from the application installation package.

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